



Washington Park ARBORETUM BULLETIN

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*Inside:
Ornamental
Bark Varieties
in the Arboretum*

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Concerning This Issue . . .

Color, texture, and variety in the garden throughout the year—the gardener's hope and challenge which we address in this and the next issue. The challenge is met on these pages by Mareen Kruckeberg who discusses the value of evergreen oaks in the landscape. Dan Hinkley also barks up the right tree in "Coats of Many Colors," which presents his suggestions for trees that display bark with a bite. Both articles are illustrated by the photography of another precious year-round resource, photographer Joy Spurr of Unit 81 whose plant portraits appear all over the world. A generous and well-organized spirit, Joy has been helping The Arboretum Foundation and the *Bulletin* with diverse photographic needs. Before a recent trip abroad, Joy took time to photograph trees, leaf, and bark that you will see on these pages.

The excitement of Fall will eventually detour into a *fallout* of leaves, before heading into winter. Seattle Tilth compost expert Madelon Bolling reports on making good mulches *from* leaves *for* trees.

In 1942, Arthur Dome first wrote about heaths and heathers for the *Bulletin*. In this issue, Art updates us on late summer and fall blooming hybrids. We hope to hear from him again before another 50 years elapse.

The definition of *arboretum* appears on the back panel of this and each issue, a policy buttressed by Curator Timothy Hohn's strong sense of its value. Two articles in this *Bulletin* highlight the critical relationship between the *research* aspect of the *arboretum* definition and its *conservation* side. To start with, is research done on birds in the Arboretum. Magellanic penguin expert P. Dee Boersma and student Kama Almasi wanted to see whether birds prefer native or introduced conifers. Although there are no penguins in Arboretum trees, observations were made of many other native and introduced bird species in these conifers. The study concludes that we need to keep bird preferences in mind so that their populations thrive; when this happens, they will continue their crucial tasks of dispersing seeds, eating insects, and adding beauty to our landscape.

Also featured is the work of Clement Hamilton, University of Washington Center for Urban Horticulture. Hamilton explains how he, a Seattle-based researcher, can conduct science that contributes to the diversity and survival of tropical forests. Our seasonal update on the Arboretum and books to consider for gifts round out this issue.

Continuing the earlier discussion of "barking up the right tree," we are pleased to welcome four new editorial board members: Kelly Dodson, Jan Pirzio-Biroli, Mary Robson, and Barbara Swift. Also, we can report that the last issue, on dry gardening in the Pacific Northwest, was requested by many municipalities. The editorial board of the *Bulletin* promises to continue reporting on hands-on solutions surrounding this approach to horticulture because we like to think that we can make a difference in the Washington Park Arboretum.

Jan Silver, Editor
The Washington Park Arboretum Bulletin

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by *Valerie Easton*

Coming in the next issue: The Northwest Winter Garden

Cover: During a recent autumn, David McDonald photographed this *Sorbus scalaris* hybrid in the Brian O. Mulligan *Sorbus* Collection, Washington Park Arboretum. According to Director Emeritus Mulligan, this tree was raised in the Arboretum from seeds received in 1958 under the name of *S. scalaris*, sent from a garden in England. The cover hybrid is similar to this species of Chinese origin, but not correct in all characteristics.

Backdrop: The trunk of *Acer tegmentosum*, in the Arboretum.
Photo by Brian O. Mulligan.

The Washington Park Arboretum Bulletin is published quarterly, as a bonus of membership in The Arboretum Foundation. The Arboretum Foundation is a non-profit organization that was chartered to further the development of the Washington Park Arboretum, its projects and programs, by means of volunteer service and fund-raising projects. The Washington Park Arboretum is administered through cooperative efforts between the University of Washington, its Center for Urban Horticulture, and the City of Seattle Department of Parks and Recreation. The programs and plant collections are a responsibility of the Center for Urban Horticulture.

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Late Summer & Fall Blooming Heathers

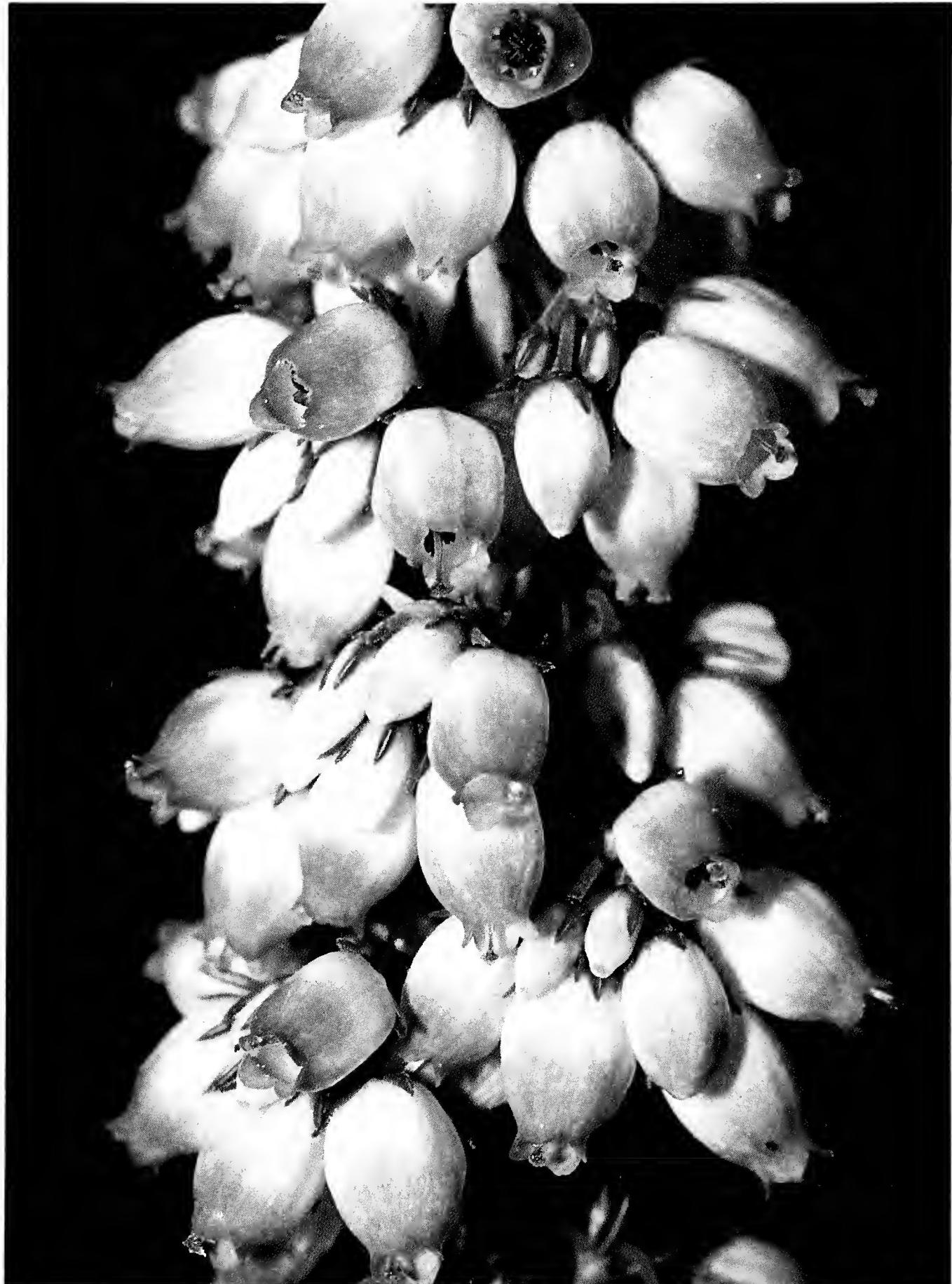
by Arthur P. Dome

An asterisk () indicates species, including varieties and/or forms, that can be found in the Washington Park Arboretum.*

The late summer and fall blooming heaths (*Erica*) and Scotch heathers (*Calluna*) are a valuable asset to any garden. They are colorful and easy to grow, and blooms are not damaged by early frosts.

These plants can do very well for any gardener who heeds their few requirements. All they need is a location that allows at least half a day of direct sun light, when the sun shines. Generally, they should have a light, friable, lime-free, well-drained soil that never dries out. Most types should be sheared back in the spring, especially while they are still young. This prevents *Erica* plants from becoming loose or leggy and/or to keep them in bounds. The majority of *Calluna* foliage needs shearing to where the previous season's blooms started.

Under these conditions, heaths and heathers can do an excellent job of replacing herbaceous perennial and annual plants that require a great deal more attention. They can be used in rockeries, in shrubbery borders, or along walks and drives in the open. Some gardeners like to plant an area with a selection in which the size, foliage,



Erica cinerea 'Eden Valley'

and blossom colors complement each other and offer a variety of blooming plants year-round. Heaths and heathers also can make ideal companion plants for azaleas, rhododendrons, kalmias,

Glossary

Ericaceous refers to a member of the Ericaceae family of plants.

Friable indicates loose and crumbly soil.

and other plants that have the same cultural requirements.

The Heaths

Erica cinerea is considered a late spring and summer blooming species, but it does have some cultivars that flower up into October and November. They usually grow from 4-12" tall and some can spread to 30" across. A few of the more desirable, longer-flowering cultivars are: 'Apple Blossom', which has light shell-pink blossoms; 'C.D. Eason', with bright magenta blossoms; 'Constance' with beet-root colored blossoms and golden foliage; 'Eden Valley', with bi-colored lavender and white blossoms; 'P.S. Patrick' with vivid purple blossoms; and 'Violacea' with deep violet-colored blossoms.

Erica tetralix cultivars bloom from June into October. Different ones can grow from 6-12" high and spread up to 15 inches. This species has forms with foliage color ranging from olive to gray to silvery. Two of the most popular are the cultivar 'Alba mollis', which has pure white flowers with silver-colored foliage and 'George Frazier', with light pink blossoms and olive-green foliage.

From July through October, *Erica ciliaris* has cultivars that bloom. They usually grow from 8-12" tall and some can spread up to 24 inches. A few of the more desirable cultivars are: 'Corfe Castle', with rose-pink blossoms; *'David McClinton', which has white blossoms with deep pink tips; and 'Stoborough', an upright grower with white blossoms and light shell-pink blooms.

Also blooming during this time are *Erica vagans* cultivars. Different ones grow from 9-24"

Photo, opposite page:

Erica cinerea 'Eden Valley' reaches six inches in height with abundant flowers and a spreading habit. Find heathers in the Arboretum on the south side of Rhododendron Glen and at the south end of the Joseph A. Witt Winter Garden.

tall and can spread up to 30 inches. Some of the more desirable cultivars are: 'George Underwood', with pinkish blossoms; *'Lyonesse', with white blossoms; *'Mrs. D.F. Maxwell', with deep rose-pink blossoms and *'St. Keverne' with pure pink blossoms.

One of the most satisfactory of all cultivars is *Erica x darleyensis*. It can start blooming in October with some cultivars still flowering in May of the next year. Also, these cultivars are the most adaptable when it comes to soil types and locations. The size of growth ranges from 8-18" tall, with a spread up to 36 inches. The early fall-blooming cultivars are: *'Alba', with white blooms; *'Darley Dale', with light lilac-pink blossoms; *'Furzey', with deep lilac-pink blooms; and 'George Rendall' and 'Ghost Hills', both of which have deep pink blossoms.

True Scotch Heathers

The true Scotch heather is *Calluna vulgaris*. This is a very diverse group of plants that are well adapted to most of the temperate zones of the United States. One can grow plants that are double flowered, single flowered, miniature or dwarf, and prostrate to tall. At different times of the year, the foliage of the various Scotch heathers can vary from light green to dark green, olive colored to silvery gray, yellow to golden, and russet to red.

The Scotch heathers with double blossoms are usually the most popular. Starting in July, 'County Wicklow' is a neat little shrub with shell-pink blossoms and bright green foliage that grows about 12" tall with a spread of 20 to 24 inches. Also starting in July, 'Kinlochreul' has the same growth habit but with pure white flowers. The 'J.H. Hamilton' is usually a little smaller grower with olive-green foliage and pink blossoms in late July. The old-time 'H.E. Beale' can have long sprays of light lavender-pink blossoms 12-14" long. These double-flowering forms can really enhance small floral arrangements and corsages.

If you would like some of the taller, more upright growing *Calluna* of 24 inches or higher, you can find them in a range of colors, starting in August. 'Alportii' has crimson blossoms and dark green foliage; 'Mair's Variety' has the dark green foliage, but pure white blossoms. For lavender blossoms, select 'Aberdeen' with its gray foliage or *'Silver Knight' with its silver-gray foliage. These plants are good for covering large areas in a hurry, but can be kept in bounds with pruning. They also can be used as background

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plants for smaller shrubs, etc. Select whatever foliage or blossom color fits into your program.

The miniature or dwarf *Calluna* are interesting all year long because of their growth habits, not their blossoms. Some to consider that rarely get over 4" tall are 'Foxii Nana', 'Minima Smith's Variety', 'California Midge', and 'Sedlanov'. They are most interesting where they can be grown as individuals and not allowed to grow together or be crowded out by faster growing plants.

You may like the prostrate growing types of heath, usually in the 2-4" high range, that are more prolific bloomers. Around the end of July, 'Mrs. Ronald Grey' has mauve blossoms, and 'White Lawn' its white bloom and bright green foliage. In August and September, 'Sister Anne' shows her light mauve-colored blossoms and a silvery type foliage. These heaths are nice to use with steps and stepping stones.

The *Calluna* that have foliage colors in various shades of yellow, gold, russet, and red at different times of the year always create a lot of interest. The quality of these colors in the spring are really enhanced when the weather is bright and sunny and the air is near freezing. Although the blossoms of these plants are insignificant, the following cultivars grow about one-foot tall and twice as wide and can be quite showy in the late summer and fall: 'Aurea', with mauve blossoms; 'Beoley Gold', with white blossoms; and *'Blazeaway', with pale lavender blossoms.

Heaths and heathers offer more than their color and hardiness. They provide Northwesterners numerous opportunities to enhance the year-round desirability of their gardens with a comparatively small amount of effort and money.

Arthur P. Dome has been interested in growing and photographing various ericaceous plants for many years. He belongs to most horticultural organizations that involve these plants. Art is a member of The Arboretum Foundation.

Sources

Most specialty nurseries and garden stores carry many of these plants or can get them for you. Also, contact:

Heather Acres, Inc., 62 Elma-Monte Road, Elma, Washington 98541

Howlands Heathers, 17479 Highway 99 East, Hubbard, Oregon 97023

Wilson's Nursery, 6227 Hopedale Road, Sardis, British Columbia V2R 1B3 Canada

An Answer to Autumn: Leaf Compost and Mulch

by Madelon Bolling

Most people associate composting with vegetable gardens, but leaf mold or compost can be used to feed shrubs and trees, as well. Some of the peat moss and manure we usually buy can be replaced by autumn's unappreciated bounty: leaves. Leaves contain many important minerals, but they are most valuable for their role as humus in the soil.

Making Leaf Mold

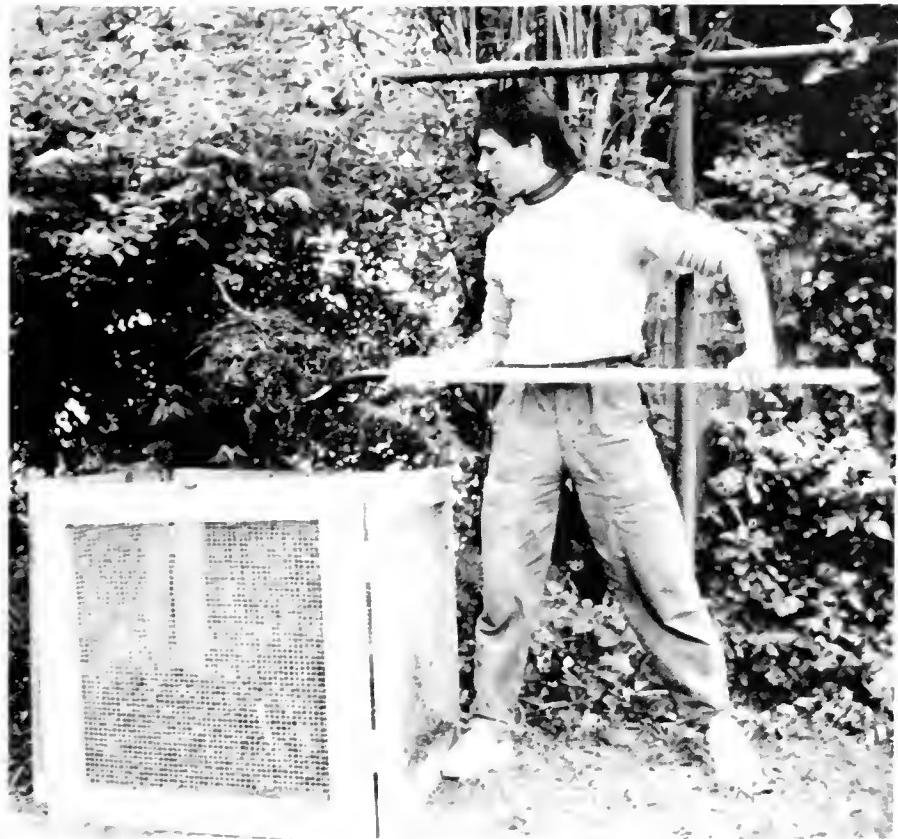
To make leaf mold (a kind of leaves-only compost), simply corral fallen leaves in a compost bin or other enclosure to keep winds from scattering them. Make sure that they are thoroughly damp, and let stand over winter. As in all composting, the optimum dampness is that of a squeezed-out sponge. In warm, dry weather—or if your leaf pile is in a sunny spot—cover it to help hold the moisture in.

Shred leaves when they are dry to reduce their volume and speed up the process of decomposition. If you don't have access to a shredder, a rotary mower will do very well. Make a low mound of leaves near a wall or solid fence to catch the shavings, then run the mower back and forth over the mound until no whole leaves are left. Repeat until all the leaves are shredded. Sprinkle the shredded leaves with water as you add them to the compost bin so that the whole pile is thoroughly damp but not soggy. If rains have dampened the leaves already, there is little to do but pile them up and wait, since most mowers and shredders cannot handle matted, wet leaves.

If you do not shred your leaves, those on the top and sides of the pile may not decompose by spring. No matter, these may be used as mulch, or they can become part of the spring compost, which often needs just such a high-carbon material to balance the high nitrogen content of fresh grass clippings.

What about Those "Problem" Materials?

There are leaves with bad reputations among gardeners. Some deserve them and some do not.



Courtesy Seattle Tilth

For example, English laurel, rhododendron, and madrona leaves—and even conifer needles—*will* break down very well in time, especially if you can shred them up first and then keep them damp.

The prickly leaves of holly and some junipers also take a very long time to break down, and make mixed compost unpleasant to handle. They are best composted separately. It helps to shred or break up these leathery leaves or needles, moisten the pile as you build it, cover it with a sheet of plastic to maintain moisture, and add a nitrogen supplement such as manure or cottonseed meal to speed the decomposition process.

People often express concern about the toxicity of leaves—rhododendron, in particular. Yes, rhododendron leaves are toxic. So are the leaves of peach, English laurel, oleander, pieris, etc.—*if* you eat them! These toxic leaves break down very nicely into the soil and, once composted, are not harmful to other plants.

Some leaves *do* need to be treated with caution, especially leaves of walnut, conifers, and eucalyptus. Most established trees and shrubs are not bothered by well-decomposed walnut or conifer leaf material, although the fresh leaves may suppress seedlings and annuals or inhibit the growth of some susceptible species. Rather than send them away, use these materials with care. Compost them thoroughly and consult horticultural experts before applying the leaf mold around especially prized plants.

Because of their growth-suppressing characteristics, cedar or other coniferous woodchips and leaves or needles work well for pathways. An 8–12' layer will compact and eventually decom-

pose into a material that is safe to use, even on vegetables. You may want to check its pH (to determine soil acidity), as this decomposed mulch may be acidic, but garden plants are less dependent upon a specific pH in the soil when there is an abundant supply of humus. Meanwhile, mulch on your garden paths will suppress weeds and keep pedestrians' feet clean and nearly dry in wet weather.

Using Mulch

Leaf mold, compost, or chipped-up deciduous tree branches, fruit-tree prunings, and shrub thinnings make an excellent mulch. Even pine cones may be run through a shredder to make a pleasant uniform mulch with all the same uses as commercial bark products.

Diseased materials should not be used for mulch. The best way to deal with these is to burn them, if possible. In some areas, such as King and Snohomish counties, it is possible to send them to large-scale composting plants that compost these and all yard wastes at high temperatures for sufficient lengths of time to kill disease organisms.

Ideally, fallen or rotting fruit should be buried to feed the soil directly. Or you may compost it if you can build a "hot" compost pile that won't attract rodents to your bins. A hot compost pile requires careful construction: equal parts of fallen leaves and fresh green grass clippings, for example, produce the ideal carbon to nitrogen ratio of 30 to 1. Large leaves may need to be shredded to encourage uniform bacterial activity. There also needs to be sufficient aeration and moisture throughout the pile, and a minimum size of one cubic yard. It is essential to turn this type of compost for aeration and mixing (always checking for sufficient moisture), as soon as temperatures pass their peak. Only three turnings—one every three or four days during the first two weeks—are usually necessary before a "rough" compost is produced in which critical materials such as fallen fruit are no longer recognizable. Further turning and curing will produce a more finished product, though little or no more heat will be manifest.

Established shrubs will benefit from an annual feeding of a half bushel (about a 5-gallon bucket) of compost worked into surface soil, and mulching from six inches away from the root crown to just past the drip line. Shallow-rooted shrubs, such as rhododendron and azalea, should be mulched very sparingly (no more than one inch deep) with compost, but not cultivated, to avoid root damage.



To feed trees, start about two feet away from the trunk, cultivate shallowly to a foot beyond the drip line, and rake an inch or two of compost into the top two inches of soil. Or, auger holes a foot deep at even intervals around the drip line and pack with finished compost.

Fruit trees will benefit from three or four inches of compost raked in as above, followed by heavy mulching to well past the drip line. As it rots, the mulch will continue to feed the tree, meanwhile regulating soil temperature, conserving moisture, discouraging weeds, promoting good soil texture, and favoring increased populations of beneficial soil organisms.

In the natural course of events, leaves, dead twigs, fruit, and branches fall from trees and return to the soil. We disturb this cycle by pruning, raking, and then sending these materials away. By composting and mulching our own tree by-products, we can keep our yards and ourselves healthier and in harmony with natural patterns.

Madelon Bolling works for Seattle's Community Composting Education Program as the Compost Hotline operator. She edited Arthur Lee Jacobson's *Trees of Seattle* and writes a column on composting for the Seattle Tilth Newsletter.

Call for Composting Information:

Seattle city limits: 633-0224
King County (outside of Seattle): 296-4466
Kitsap County: 876-7157
Pierce County: 591-3678
Snohomish County: 388-3425
Thurston County: 786-5441
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Elsewhere, please contact the cooperative extension service for your county.

Can Birds Tell the Difference between Native and Introduced Conifers in the Arboretum?



by P. Dee Boersma
and Kama N. Almasi

The scientific literature is filled with examples showing that the types and structures of vegetation in a habitat often indicate the types of birds that will be present there and in what numbers (MacArthur and MacArthur 1961).

It is not surprising that birds are closely attuned to vegetation. They eat the seeds, fruits, and nectar that the plants produce and the insects that feed on plants. They use the plants for protection against the elements, as refuges against predators, and as sites for nests. In our study, we looked at what happened to birds when (1) landscape was altered by the type of trees planted, and (2) the structure and size of the trees stayed the same. We also wanted to know if birds can tell the difference between native and introduced conifers.

Conifers are the dominant tree species in the Pacific Northwest. Since native birds in the Northwest live among conifers, we expected that native birds might prefer native conifers. On the other hand, we wanted to know if one conifer looks like any other to a bird.

To examine these questions, we studied four plots of trees in the Washington Park Arboretum where native and introduced conifers grow in patches near each other (Table 1). Two of these plots had native conifers: Douglas-fir (*Pseudotsuga menziesii*), western red cedar (*Thuja plicata*), and western hemlock (*Tsuga heterophylla*). The two other plots had conifers from Asia and Europe, primarily true cedars (e.g., *Cedrus libani*, *C. deodara*, *C. atlantica*) and true fir

(*Abies x insignis*), as well as coniferous trees from Oregon and California (e.g., the giant sequoia, *Sequoia sempervirens*, and Port Orford cedar, *Chamaecyparis lawsoniana*). The native plots were 1,026 m² and 1,504 m² in size; the plots containing introduced conifers were 1036 m² and 1664 m². The four plots had trees of a similar range of heights (7.5 to more than 30 meters = 25-100 feet), spacing (each plot between 21 and 27 trees), and understory coverage.

For the study, we compared each native plot with a plot having introduced conifers. One native plot was approximately 35 feet from the Graham Visitors Center; the corresponding plot of introduced conifers was $\frac{1}{3}$ mile southwest of the Visitors Center, bordering a residential area. The second native and introduced conifer plots to be compared were adjacent to each other, approximately $\frac{1}{4}$ mile from the Visitors Center, off Arboretum Drive East. All four plots were about the same distance from roads and water and appeared to be visited about equally by people and pets; all plots were within a mile of each other, so that a bird could easily visit all of them. If birds had a preference, we expected to see it by finding them more often in one type of conifer plot than the other.

A census of each plot was taken from a location where all the birds in the plot could be viewed at once. In the winter, on five different days for ten minutes each, two observers identified all the birds seen or heard in each plot. In the spring, all the birds in the plots were counted in the morning on four different days and on four different days in the afternoon in the same manner.

We found that 15 bird species from 11 families used the plots in the winter. Nine of the species were found both in the native and introduced conifers (Table 1). The crow (*Corvus brachyrhynchos*), golden-crowned kinglet (*Regulus satrapa*), and red-breasted nuthatch (*Sitta canadensis*) visited all the plots.

Found exclusively in the native conifer plots were three native bird species, including Bewick's wren (*Thryomanes bewickii*), bushtit (*Psaltriparus minimus*), and sharp-shinned hawk (*Accipiter striatus*), and two introduced species, including the starling (*Sturnus vulgaris*) and house sparrow (*Passer domesticus*). The starling and house sparrow may have been in these conifer plots because one was closer to the main building in the Arboretum where there are bird feeders. The average number of bird species per single observa-

Table 1. Lists of native and introduced bird species sited in both native and introduced conifers during a study in the Washington Park Arboretum, winter/spring 1990-91.

Plot	Conifers (# of trees)	Winter Birds	Spring Birds
Native 1	Douglas-fir (9) western hemlock (3) western red cedar (6)	American crow American robin Bewick's wren black-capped chickadee bushtit European starling golden-crowned kinglet house sparrow Oregon junco red-breasted nuthatch sharp-shinned hawk	American crow American robin band-tailed pigeon barn swallow black-capped chickadee bushtit cliff swallow European starling gold-crowned kinglet house sparrow Oregon junco rufous-sided towhee song sparrow
Native 2	Douglas-fir (7) western hemlock (6) western red cedar (7)	American crow American goldfinch American robin black-capped chickadee European starling gold-crowned kinglet house sparrow red-breasted nuthatch Townsend's warbler varied thrush	American crow American goldfinch American robin band-tailed pigeon black-capped chickadee cliff swallow flycatcher gold-crowned kinglet great blue heron house finch house sparrow Oregon junco purple finch ruby-crowned kinglet rufous-sided towhee song sparrow western tananger 4 unidentified species
Introduced 1	Atlas cedar (3) Cedar of Lebanon (7) Coulter pine (2) Deodor cedar (2) true fir (3)	American crow American goldfinch gold-crested kinglet Oregon junco red-breasted nuthatch red-breasted sapsucker	American crow cliff swallow European starling house sparrow red-breasted nuthatch
Introduced 2	Cedar of Lebanon (1) Colorado spruce (6) Cypress/cedar (1) Giant sequoia (5) Port Orford cedar (10) silver fir (1) <i>Taiwania cryptomerioides</i> (2)	American crow American goldfinch American robin black-capped chickadee gold-crowned kinglet red-breasted nuthatch varied thrush	American crow American robin barn swallow brown-headed cowbird cliff swallow house finch rufous-sided towhee



Bushtit



Song sparrow



Goldfinch

Illustrations by Fred Sharpe, published with permission
of the Seattle Department of Parks and Recreation

tion in the native sites (4 species) was significantly greater than in the introduced conifers (2 species).

In spring 1991, we also saw more bird species in the native plots during each observation. Twenty-four bird species occurred in the native conifers and only ten in the introduced conifers. Crows, cliff swallows (*Petrochelidon pyrrhonota*) and three introduced species (the starling, house sparrow, and house finch [*Carpodacus mexicanus*]) were found in both native and introduced plots. The junco (*Junco hyemalis*), golden-crowned kinglet, song sparrow (*Melospiza melodia*), band-tailed pigeon (*Columba fasciata*), and black-capped chickadee (*Parus atricapillus*) were seen only in the native tree plots. All bird species found in both of the introduced conifer plots also were found in native conifer areas. The average number of bird species per single observation in the native sites (5 species) again was significantly greater than in the introduced sites (2 species).

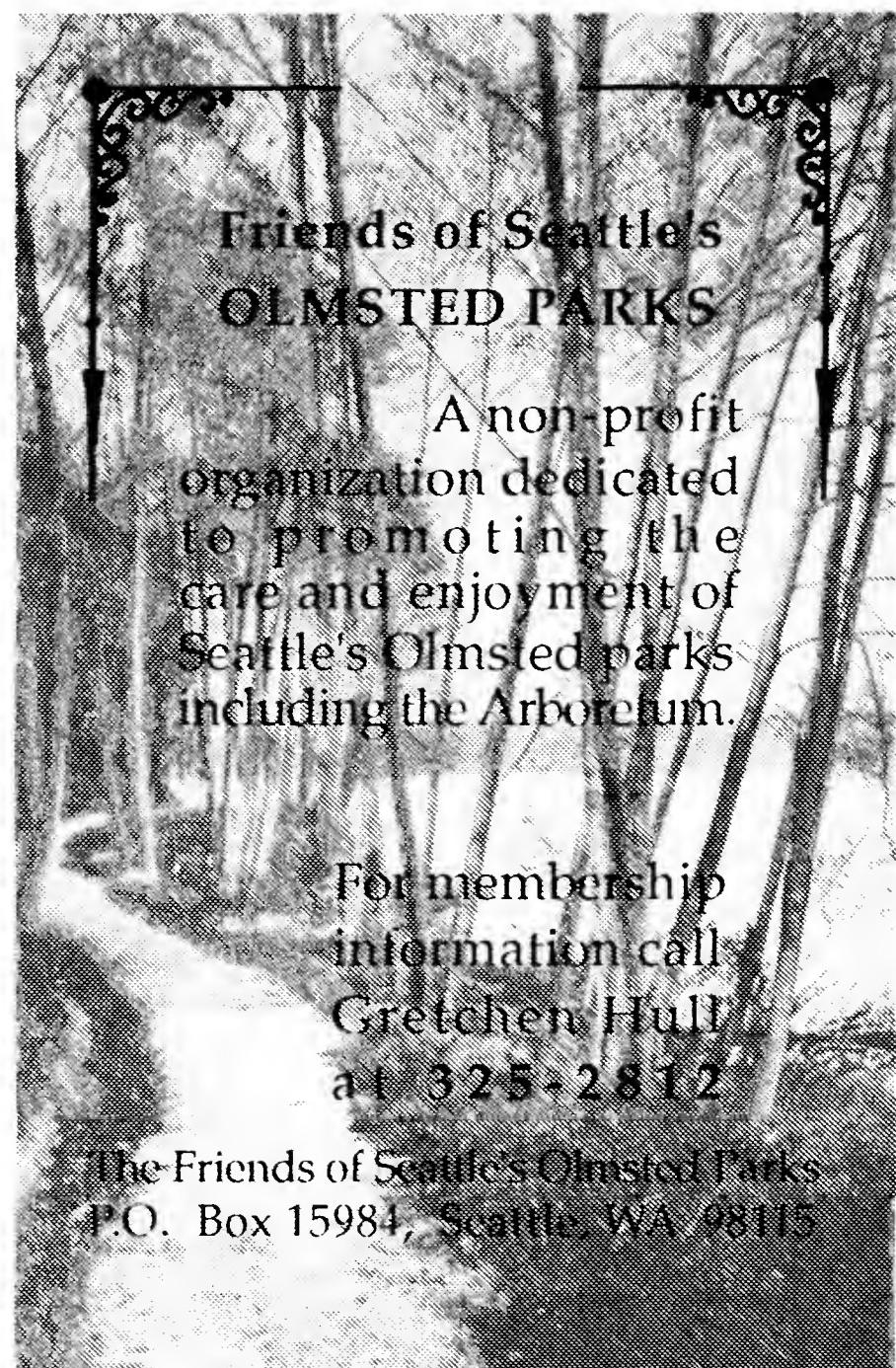
C.A. Gavareski (1976), a graduate student in forestry, found that changing the vegetation in the Washington Park Arboretum resulted in the decline of native bird species; the species most negatively affected were the bushtit, red-breasted nuthatch, and Bewick's wren. Birds were counted if they landed on areas only briefly, so sites with introduced conifers may appear to have more active birdlife than is the case. Several native species, however, were seen only in the native conifers, showing how important the native trees are to these birds.

There has been a rapid decline in native, undisturbed coniferous vegetation in the Pacific Northwest. Considering the importance of this vegetation to our native birds, native conifers should be planted where replanting is done; it is important for providing food and refuge for native bird species.

When picking plants for the yard, choosing native species may be one way to help native birds survive in their increasingly urbanized and fragmented environment. The trees you plant affect the Bewick's wren, bushtit, kinglet, junco, chickadee, and song sparrow. Conserving our native vegetation is one of our best lines of defense in protecting our native wildlife. Birds can tell the difference.

Acknowledgment

We thank Linda Ward for helping with the winter counts in the native and introduced plots, and for her contribution to the intellectual development of this project.



P. Dee Boersma is a professor in the Institute for Environmental Studies and Department of Zoology, University of Washington. Dr. Boersma is well known for her work on Magellanic penguins.

Kama N. Almasi received a B.A. in Asian studies from Connecticut College. She was a fifth-year student at University of Washington, taking science courses. In fall 1991, she started graduate work at University of California, Davis. This paper is an outgrowth of a presentation with Linda Ward in Dr. Boersma's conservation biology class.

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Coats of Many Colors

by Daniel J. Hinkley

A color photo essay of ornamental barks in the Arboretum follows this article.

An asterisk (*) indicates species, including varieties and/or forms, that can be found in the Washington Park Arboretum.

The outer layer of shrubs and trees plays second fiddle to the attention paid to foliage, flower, and fruit in the garden. A pity, it seems, as it is the skin of these plants that is with us the full calendar, in contrast to their more ephemeral attributes. Ghostly white, sensually smooth and bronze, brilliant reds and yellows, and patchwork quiltings of red, gray, green, and brown all can describe the varieties of interest provided by the bark of many woody plants.

Bark can be a tactile ornament, meant for stroking and polishing with our hands as we walk our gardens, or for marveling at with its bright contrasting colors during the winter months. It also can be a focal point in the garden year-round, as with the smooth and gray pachydermic monoliths of the European beech. In *Trees and Shrubs Hardy in the British Isles*, W.J. Bean did not mention the beauty of bark on several of the species included below. Perhaps these special effects had not yet begun to develop in many of the specimens he had observed. Or, is it that even among the more astute plantspeople, bark is often neglected as worthy ornament for our gardens?

How Bark Develops

The cambium of woody plants, located just under the bark, is the tissue that is responsible for growth in diameter. Each spring as growth resumes, millions of cells comprising this cambium layer are replicated through cell division. Those new cells that form inside of the cambium become the xylem, the tissue that draws water and nutrients from the soil and pumps them to the leafy superstructure of the plant above. Sister cells also form on the outside of this tissue and become the phloem—"pipework" to distribute simple sugars produced in the leaves of the plant through photosynthesis.

Phloem and xylem cells usually function for a

few years at most; older generations of cells cease to function in their original capacity but the plant has not yet lost interest in their existence. More often than not, one or more layers of corky tissue, impregnated with waxes, form in the outermost aging phloem that will protect the fragile cambium layer only millimeters within. Suberin, a common "filler" of these dead cells, is present in the highly pliable, yet tough and waterproof, stopper of fermented libations. The cork of commerce is actually dead suberin-filled cells harvested from *Quercus suber*, the cork oak. Ultimately, these aging cells, continually replenished from behind the ranks, are expelled from the tree. It is the last hurrah of these sloughed cells—the bark—that provides garden interest to the horticulturist. The following species of plants represent a small percentage of those that can be grown for the effects of bark alone.

Three *Rubus* Species with Exceptional Bark

The white-stemmed brambles of the genus *Rubus* generally are absent from the gardens of the Northwest. It requires some effort to keep them in bounds, though by no means is impossible since many European gardeners have utilized them effectively in their gardens for years. Three

Glossary

Cambium is the plant tissue responsible for growth in diameter, found in between the phloem and xylem.

Coppice refers to periodic and severe pruning as a means to rejuvenate young, vigorous growth.

Glaucous is the blue or white coloration provided by a thin coating of wax found on leaves or stems.

Gymnosperm, literally "naked seeds," are one of the more primitive components of the plant kingdom comprising the conifers, among others.

Panicle is a branched flower cluster.

Phloem is the tissue responsible for translocation throughout the plant of sugars that have been produced by photosynthesis.

Photosynthesis is the process of food manufacturing within a plant.

Suberin is a waxy material found in the cell walls of cork tissue.

Sucker is to send out shoots from the root or lower part of the stem of the plant.

Xylem is wood; a plant tissue which conducts water and minerals.

species of this genus, all from China, stand out as being top notch with their shining white, albeit thorny, stems during winter months.

Rubus cockburnianus is a medium-sized shrub with finely cut foliage and stems that emerge fresh each year a lime green. As the summer progresses, a thicker glaucous coating is laid down and by winter the stems are white as December hoarfrost. More vigorous in growth is **Rubus biflorus* var. *quinqueflorus* which produces a many-stemmed shrub to fifteen feet in height. The winter canes are as brilliant, if not more so, than *R. cockburnianus*, though on an altogether larger scale. Recently introduced from China by the Arnold Arboretum is yet another species, *R. lasiostylus* var. *hubeiensis*, perhaps the most striking and attractive of this trio. The bark of this species is intensely white and coated with a multitude of tiny hairline bristles quite unlike the vicious thorns we are all too familiar with in this genus. This species provides an intensely colored, yet finely textured, effect and could be used in back of a smaller border.

All *Rubus* species will sucker from the base, so precautions should be taken to either contain them or simply allow them ample room. They should be coppiced to the ground each year for two reasons. First, the canes lose their intensity after one season, fading to a dull pearlish white. Second, these species bloom and bear fruit on second-year wood, and it is prudent to prohibit them from doing so lest they escape your garden via visiting birds and contaminate our native flora with yet another unwelcome introduced species.

The Bark of Dogwood

The red-twigs dogwoods in the genus *Cornus* have long been grown for the intensely red or yellow bark in winter, their primary season of interest. **Cornus alba* 'Elegantissima' performs back to back with its bright red winter stems giving way in spring to gray-green leaves neatly margined with white. In the Washington Park Arboretum, it can be found between Azalea Way and Lake Washington Boulevard, near the flats. The bark of **Cornus alba* 'Kesselringii' (also near the flats) is remarkably dark red, approaching black-purple. The foliage of this cultivar is dark green and as a whole rather nondescript during the summer months. However, during winter a massing of this shrub, combined with the yellow twig dogwood, **Cornus stolonifera* 'Flaviramea' for contrasting color, is a bold yet refined composition.

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The newly introduced yellow twig dogwood cultivar, *Cornus alba* 'Silver and Gold', has bright yellow stems in winter with white variegated summer leaves. Every third year these species of dogwood will benefit greatly from being cut to the ground in early spring in order to stimulate new growth and intensify color during the winter months.

Mottled Persian Ironwood

**Parrotia persica*, the Persian ironwood, is often thought of as a small tree or large shrub whose main offering of ornament is autumn coloration of intense oranges and reds. This witch-hazel relative, however, also develops beautifully mottled bark in flaking patches of green, gray, and brown as the plant matures. It is interesting to note that in its native haunts of northern Iran, *P. persica* grows so thickly that its branches self-graft to adjacent specimens, making impenetrable fences that extend for miles. A fine specimen of *P. persica* can be observed in the Hamamelidaceae collection adjacent to Arboretum Drive East.

Interesting Effects of the Elm Family

The elm family, Ulmaceae, is not considered by most as a group of plants that provides interesting

effects from its bark. However, there are at least three that are quite beautiful in this respect and worthy of mention.

Zelkova sinica, a little known or grown species, provides an outstanding patchwork effect of bark in greens and browns. This species is a medium-sized shade tree of strong wood, graceful habit, and—as with its more common cousin, **Z. serrata*—good autumn coloration. It is not in the collections of the Washington Park Arboretum, though I successfully germinated seeds of this species last spring. *Zelkova sinica* should be considered a desirable tree for our landscapes, of multi-purpose and possessing year-round interest.

More frequently encountered, though not common in landscapes and city streets, is **Ulmus parvifolia*, the Chinese elm. Unfortunately, its relative, the greatly inferior **Ulmus pumila* (the Siberian elm), also has been dubbed the Chinese elm. The true Chinese elm is a small tree possessing small glossy green leaves held on a rounded crown. A flaky brown mottled trunk provides beauty year around. *Ulmus parvifolia*, resistant to the Dutch elm disease, is an excellent choice for the small patio or garden.

Pteroceltis tatarinovii is yet another member of Ulmaceae that is rare in both collections and in commerce, yet available if sought. Roy Lancaster, noted English plantsman, describes its mottled bark as rivaling **Stewartia pseudocamellia*, the most beautiful of *Stewartia* species in this respect. *Pteroceltis* has small glossy green leaves that one might suspect are evergreen by their nature, yet proves to be fully deciduous in our climate. It would make a rare, yet lovely, specimen tree in a moderately sized urban landscape.

More Species of Interest

**Lagerstroemia* species and hybrids, the crape myrtles, have been grown in the Northwest for many years, yet it is infrequent that we have a summer of significant length and warmth required to produce flowers. No matter, as it is the bark of this tree that brings us a much longer and more substantive season of interest. Many cultivars and hybrids exist and each brings a different effect with its bark of crisped flaky red, mottled greens, or olive and gray. There is a specimen on the south side of the Center for Urban Horticulture and several hybrids along Azalea Way in the Arboretum. One well-known specimen is located in the Medicinal Herb garden on the University of Washington campus. Placed adjacent to the

path, its bark is polished and oiled on a daily basis by the hands of visitors as they pass by. Proof enough that some bark is tactilely pleasing as well as beautiful from afar.

For forty years, **Persea yunnanensis*, the “hardy” avocado, has grown along the upper trail just north of the Peony collection, across from the Legume section of the Arboretum. Native to southwestern China, this specimen was raised here from seeds received from China through the Arnold Arboretum in 1938. *Persea americana* is the common edible avocado of commerce that is hardy only in semi-tropical areas. In my estimation, *Persea yunnanensis* is one of the most overlooked broad-leaved evergreen trees in the collection. It produces a small tree to 30 feet with white flowers produced in loose panicles in summer. Shiny linear leaves to four inches remain on the tree year-round. Best of all is its highly textural black skin reminiscent of tanned alligator hide (from a time when it was not considered ecologically inappropriate fashion). The specimen in the Arboretum has consistently provided fruit for local growers to collect and grow, and it is frequently encountered in local nurseries and plant sales. Consider this hardy and tidy species as a small tree for foundation plantings or as an evergreen hedge.

**Pseudocydonia sinensis* is a rare relative of the common edible quince, *Cydonia oblonga*, as well as the flowering quince, **Chaenomeles speciosa*. *Pseudocydonia*, native to China, is a rounded tree to 20 feet in height. White pear-like blossoms are produced in early spring followed by very large oblong fruit that is much like quince—hard as a rock, even upon ripening. The interest of this tree is the beautiful mottled bark which takes on shades of white, gray, green, and brown. I first encountered it while in Japan and marveled at how intensely beautiful the bark was. Later, I discovered that several are growing in Seattle, including an exemplary specimen south of the Botany Greenhouses at the University of Washington, adjacent to the windmill palms (*Trachycarpus fortunei*). This is an outstanding diminutive tree that deserves more attention as a multi-seasonal plant for the small landscape.

To ignore the birches in an article on bark is truly sacrilegious. With their beauty comes pitfalls and detriments, yet to avoid these trees because of their susceptibility to aphids is an unfortunate attitude of many people. Their propensity of hosting these insect pests is forgiven when one

realizes the pests themselves provide an abundance of food to many bird species in our area. Bushtits, chickadees, and yellow- and red-crowned kinglets all eagerly feast on the grazing, yet undamaging, pestilence associated with these trees. It is not a question of whether or not to plant a birch species, but where it should be placed in the landscape. Wise placement is away from underlying objects that may inherit the sticky rain caused by these "critters."

**Betula pendula*, the common European birch, has been panned by landscape designers who are currently planting thousands of the Himalayan **Betula jacquemontii*. It dons brilliant and nearly flawless chalky white bark, making one suspicious that they have in fact been recently painted. The most lovely and deserving of planting in our landscapes is another infrequently encountered Himalayan species, **B. albo-sinensis* var. *septentrionalis*. Smooth glossy pink and silver bands cover the trunk and older branches. One of the true delights of being a horticultural educator is being able to show this species to students and witness their marvel and fascination at a plant so unjustifiably scarce in our area.

The flowering plants do not hold a monopoly on cuticular interest as many gymnosperms exhibit bark of extraordinary beauty. Though many species of pines are known for lovely platy bark, the best of the lot is perhaps **Pinus bungeana* from China. Though one must wait for the effect, which could be some time, the bark develops into a dazzling patchwork of white, grey, brown, and green as the plant matures. Few species of plants, tropical or temperate, could rival this pine for the patchwork effect alone. Often found in or near temple gardens of China, they are seldom seen in the Puget Sound region. The Arboretum hosts one specimen and an 8' tree was recently planted on the south end of Sieg Hall at the University of Washington.

Taxus brevifolia, the Pacific yew, is native to the Puget basin and currently harvested as a source for taxol, an effective treatment for advanced cancers. Though the innards of this tree have been exhaustively studied and reported, the fact that it possesses extraordinarily beautiful bark is seldom mentioned. Flaky patches of green, grey, and red provide a finely textured and colorful framework for the evergreen needles that spring from its branches. See the cover story in the winter 1991 issue (53:4) of the *Bulletin*.

As landscape designers, horticulturists, and

garden enthusiasts, we choose plants for the landscape for many reasons. Autumn color, floral beauty, fragrance, and showy fruit are more often than not the criteria for selection. Let us not fail to consider the scaffolding that bears these attributes. The interest provided by bark is a treasure that can be enjoyed twelve months of the year.

Daniel J. Hinkley, once and future editorial board member, is a horticulture instructor at Edmonds Community College. Dan owns and operates Heronswood Nursery, specializing in unusual and difficult-to-locate trees, shrubs, vines, and perennials.

Patricia Pineheart Oswald

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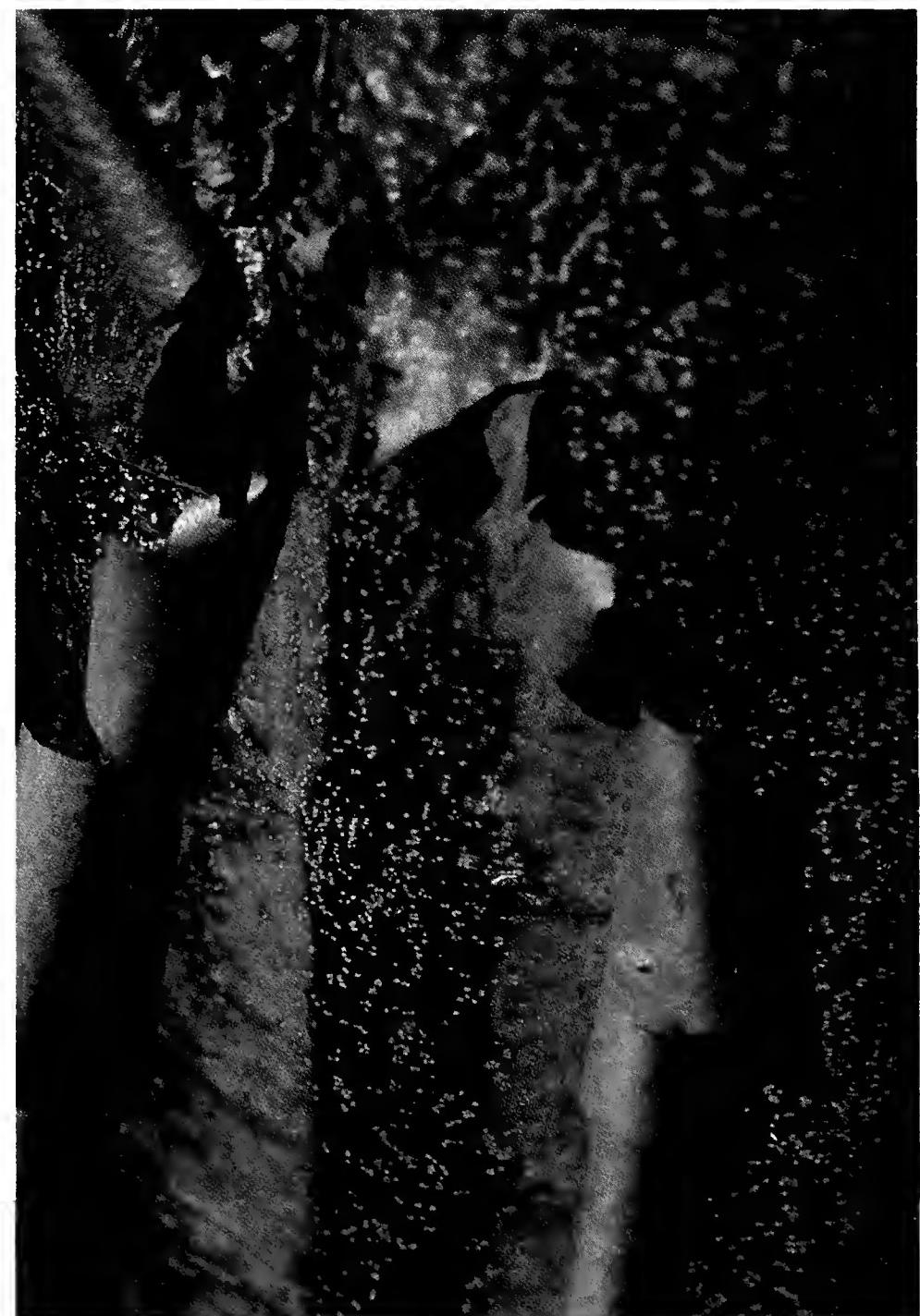
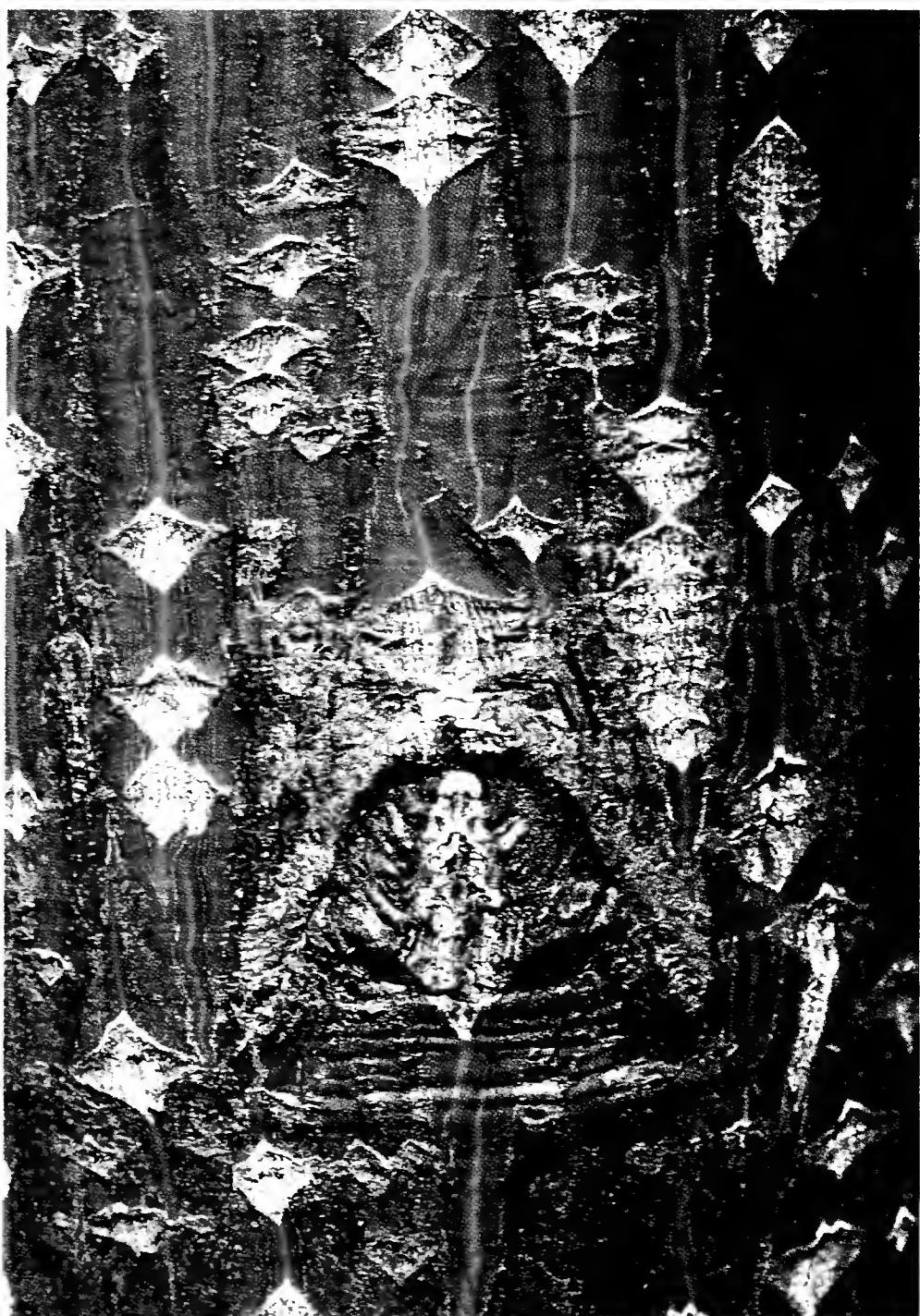
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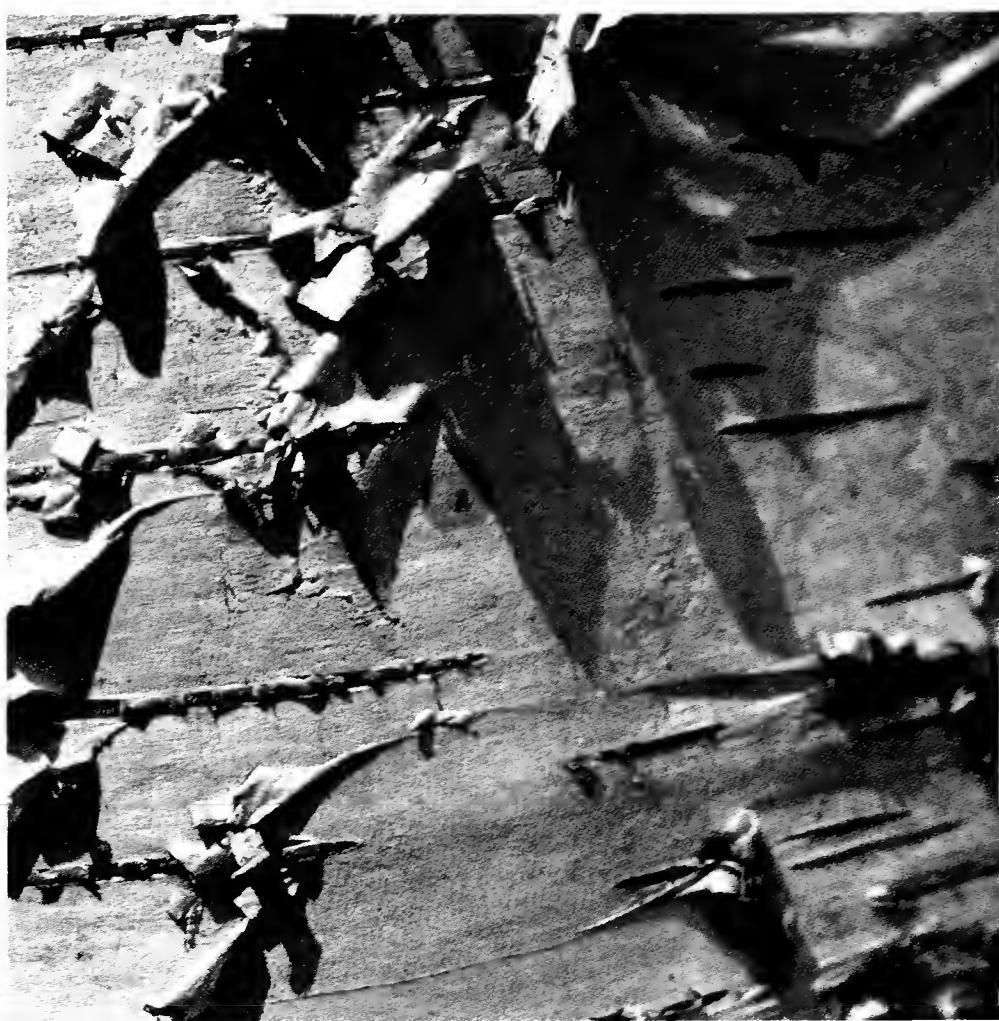
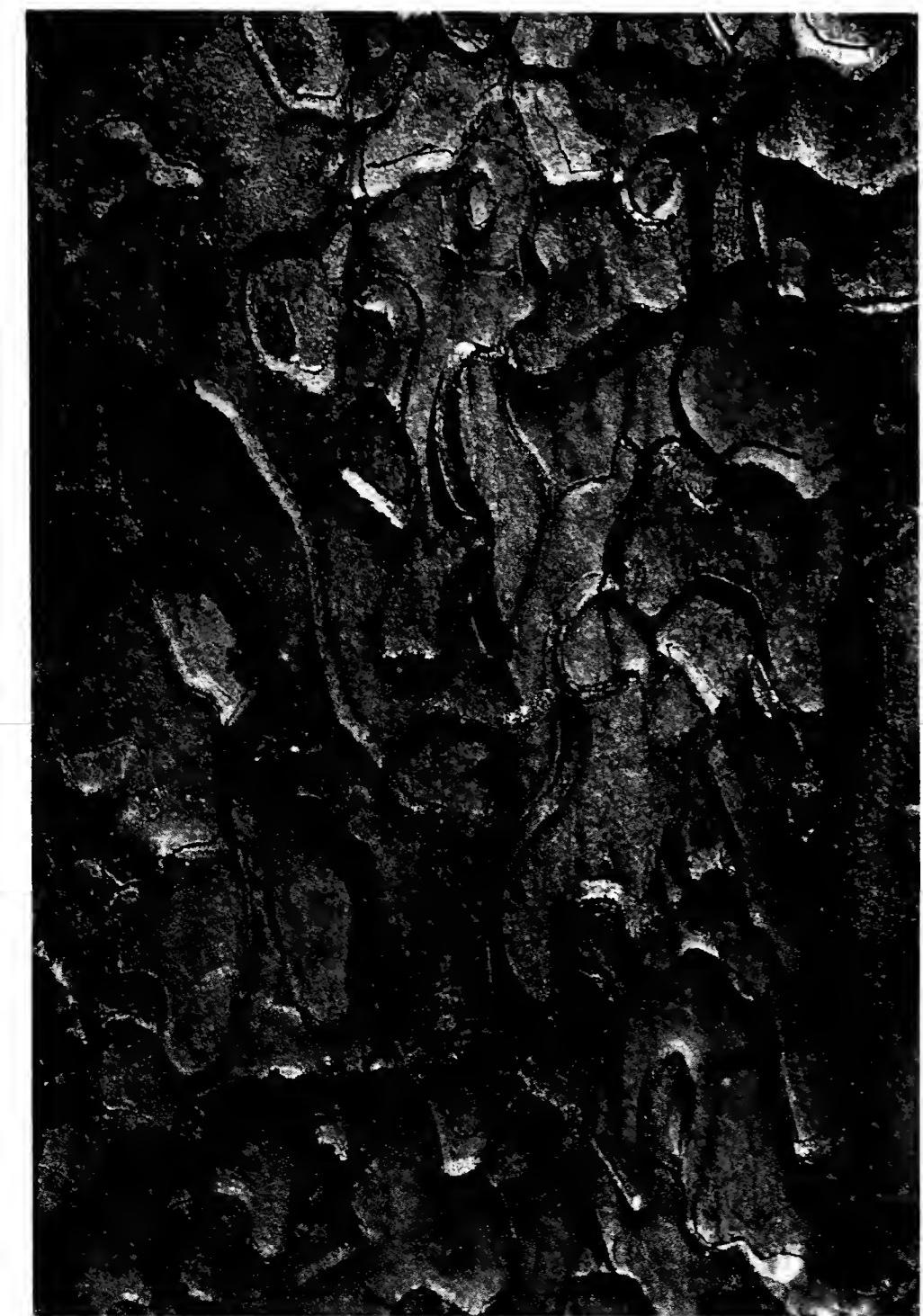
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Ornamental Bark in the Washington Park Arboretum

Upper, left to right:
Betula albo-sinensis
Taxodium distichum (bald cypress)
Pinus ponderosa (Ponderosa pine)
Betula platyphylla (Asian white birch).

Lower, left to right:
Acer refinerive
Acer griseum (paperbark maple)
Pinus resinosa (red pine).

Photos by Joy Spurr
(*Pinus resinosa* by Daniel J. Hinkley)



Quercus sadleriana grows 6-8' tall and has the largest evergreen oak leaves. Here, under a Douglas-fir, it is combined with *Viburnum carlesii*, with the fern *Polystichum munitum* and *Galax urceolata* below it.

Evergreen Oaks for Northwest Gardens

by Mareen Kruckeberg

Photos by Joy Spurr

Evergreen oaks are grown for beautiful foliage that has variation in color, texture, size, and shape.

An asterisk (*) indicates species, including varieties and/or forms, that can be found in the Washington Park Arboretum.

Years ago when my husband Art and I were busy acquiring new plants for the garden, our quest for natives did not go far beyond the Pacific Northwest. However, one intrepid collector and friend was willing to go much farther afield, and he was very successful. His botanizing took him to the Southwest—from California east to Arizona and New Mexico. The introductions he brought back have enriched our gardens immeasurably. The evergreen oaks of the Southwest were a part of these collections.

Not only did this collector gather the seed of evergreen oaks, but he germinated and grew these unusual trees and shrubs of the desert states. He found they acclimated quite well. The collector's

Glossary

Entire leaves have no teeth or lobing; they are smooth.

Internode is the part between two nodes of a stem.

Lanceolate leaves are shaped like a lance head.

Obovate leaves have tips larger than the base.

Rugose (wrinkled) means that the veins are sunken and the spaces between are elevated in the leaves.

Scurf is scale.

name was Carl S. English, Jr., and his show place was, and is, the Hiram M. Chittenden Locks in Seattle's Ballard district. Many of our original plants are from his collections.

People who visit our garden in Richmond Beach, north of Seattle, are always attracted to the evergreen oaks. Very often they are astonished that the tree or shrub that intrigued them is, in fact, an oak. It is not like any oak they are familiar with, as many look more like holly. But as the plants mature and produce the familiar acorn, there is indisputable proof.

We grow many different species of these oaks for their beautiful foliage. From May into August, the new growth can be as showy and attractive as flowers, with colors ranging from bright red to fuzzy pink, and soft gray-green to tawny yellow. The size of the leaves ranges from the tiny *Quercus dumosa* (at less than one inch) to **Q. sadleriana*, the largest at 7" long. Some evergreen oak leaves are heavily veined, and their textures vary from rugose to shiny and smooth.

Quercus myrsinifolia is in the Japanese Garden of the Washington Park Arboretum.



Many garden plants are grown for their spectacular show of beauty while flowering, and they are a great joy for that brief time, but offer little to the landscape design for the rest of the year. Foliage plants provide a quieter beauty, but for a much longer period. The evergreen oaks, in particular, provide a variation from the other broad-leaved evergreens in the garden such as rhododendrons, viburnums, and cotoneasters, which often are over used.

Growing Evergreen Oaks

Most evergreen oaks like sun, but some prefer shade. They all require excellent drainage. Standing water in the root zone means death. This can be a hidden danger, as you might not be aware of hardpan 3 feet down; when water reaches it, it cannot penetrate and so spreads out. The roots of the oak are forced to do the same, thus being drenched for long periods.

A bad combination is a specimen evergreen oak and a lawn. The lawn needs much more water than the oak can handle. Planting on a slope is one solution; another is to plant in the root zone of a large tree. The tree roots tend to be greedy and will take up the excess water. Except for this root-rot problem, which mostly can be avoided, our plants have been free of any disease. We have had no noticeable damage by insects.

Many Species for Northwest Gardens

My favorite evergreen oak is a native, **Quercus sadleriana*, from the Siskiyou Mountains in southern Oregon. It has deep yellow-green leaves that are prominently veined, large, and really quite spectacular—especially as they expand in early spring. *Quercus sadleriana* is an understory plant in its native setting and grows 6–8' tall; it also will get this wide, if given the space. Give it partial or



The netleaf oak, *Quercus reticulata*, has showy veins.

afternoon shade. We use three specimens as feature plants under a large *Douglas-fir, and have a bed of *Cyclamen hederifolium* under the same canopy. The cyclamen has large green leaves that are marbled silver and white, and rose pink flowers in late summer. It likes the same conditions as the *Q. sadleriana*.

**Quercus vacciniifolia*, the huckleberry oak, is found on high slopes and ridges of the Siskiyous and Sierra Nevadas. It is a shrub up to 4' tall, with small, oval, mostly entire leaves, covered beneath with pale gray scurf. This tree is slow growing and variable, but a delight in a dry sunny spot.

**Quercus chrysolepis* has a wider range, from southwest Oregon into California, Arizona, and New Mexico. Also known as canyon live oak or maul oak, it has holly-like juvenile foliage, becoming entire in older trees. There is a great deal of variation in size and shape, depending on the conditions they grow in, but the ones found in open situations form a wide-spreading tree of 30 or 40' high, with massive horizontal limbs and a short clear trunk. In a California park, one of these huge

The smallest evergreen oak leaves are on *Quercus dumosa*.



Quercus hypoleucoides leaves are white woolly beneath.

limbs has become a much-used walkway for little feet; even though there is probably no danger, a nervous Parks Department felt it prudent to adequately prop up the irresistible detour.

We have grown **Quercus agrifolia*, the California live oak, for many years, but the last three record cold winters have taken their toll. This last winter, we finally lost our twenty-year-old specimen. Some of the younger plants are making a valiant attempt from the roots, but it is a borderline tree for hardiness in North Seattle. In warmer areas comparable to the Arboretum or the Chittenden Locks, it might do very well. It is the fastest growing of any of the evergreen oaks we have; plants grow up to six feet per year.

**Quercus hypoleucoides*, the silverleaf oak, has done well for us. The leaves look like they've been waxed; they are lance shaped, thick and leathery—shiny dark green above and densely white woolly beneath. Ours is a small tree, but it can vary from a 6' shrub to a tree 65' tall. Arboretum visitors can see this unique and ornamental species, which is from Arizona and New Mexico, close to the Graham

Quercus glauca has yellow-green leathery leaves.



Visitors Center and near Rhododendron Glen.

**Quercus dumosa* (found near the Japanese Garden) and *Q. durata* are California scrub oaks. There is very little difference between them away from their native habitats, but in the wild, *Q. durata* only grows on serpentine. The foliage and acorns are even more variable than tanbark oak, but it is worth growing for its tiny toothed leaves and twiggy habit. I plan to try them for bonsai because of the small leaf size.

The netleaf oak, **Quercus reticulata*, is well worth growing. It has dark green obovate leaves with the network of veins clearly showing on the back. When spindly specimens are pruned back severely, they will form an attractive new compact shrub. Find specimens at the north and south ends of Azalea Way.

There is a lot of variation between species as well as within a species. As an example, in northern California we collected acorns of **Lithocarpus densiflorus* (formerly in the genus *Quercus*, but changed because of technical difference with flowers). Some of the progeny of the so-called tanbark oak were very fast growing and became trees, whereas others were slow and remained shrubs. This variation is noticeable in young plants from the size of the leaves and length of the internodes, so you can judge the amount of space needed for a mature specimen. The Arboretum's best specimens are between Azalea Way and the Lynn Street Bridge.

In the landscape, *Lithocarpus* can be a focal point because of its large evergreen leaf that can serve as a background plant for almost anything, including deciduous trees. The new growth is fuzzy pink or tawny yellow. In addition to the shrubby form which has been named **L. densiflorus* var. *echinoides*, there is a remarkable mutant, *forma attenuato-dentatus*, that has created a lot of interest.

Exotic Species

We also grow a number of exotic evergreen oaks. Three from China and Japan are **Quercus phillyreoides*, **Q. myrsinifolia*, and **Q. glauca*. *Quercus phillyreoides*, grown near the north end of Azalea Way and near Arboretum Drive East, is a small tree with glossy smooth obovate leaves, usually bronze tinted when unfolding. Some years the leaves have been a bright red—very striking. *Quercus myrsinifolia* is a compact, densely branched, round-headed small tree. Grown in the Japanese Garden, it has yellow-green lanceolate leaves with fine tapered tips. New growth is

purple-red when unfolding. *Quercus glauca* is also a small tree or large shrub. The yellow-green leathery leaves are oblong, coming to an abrupt point, and are much larger than the two previously named species. The water requirements of these three species are not as restrictive as our natives. They should become better known as they will make good garden plants.

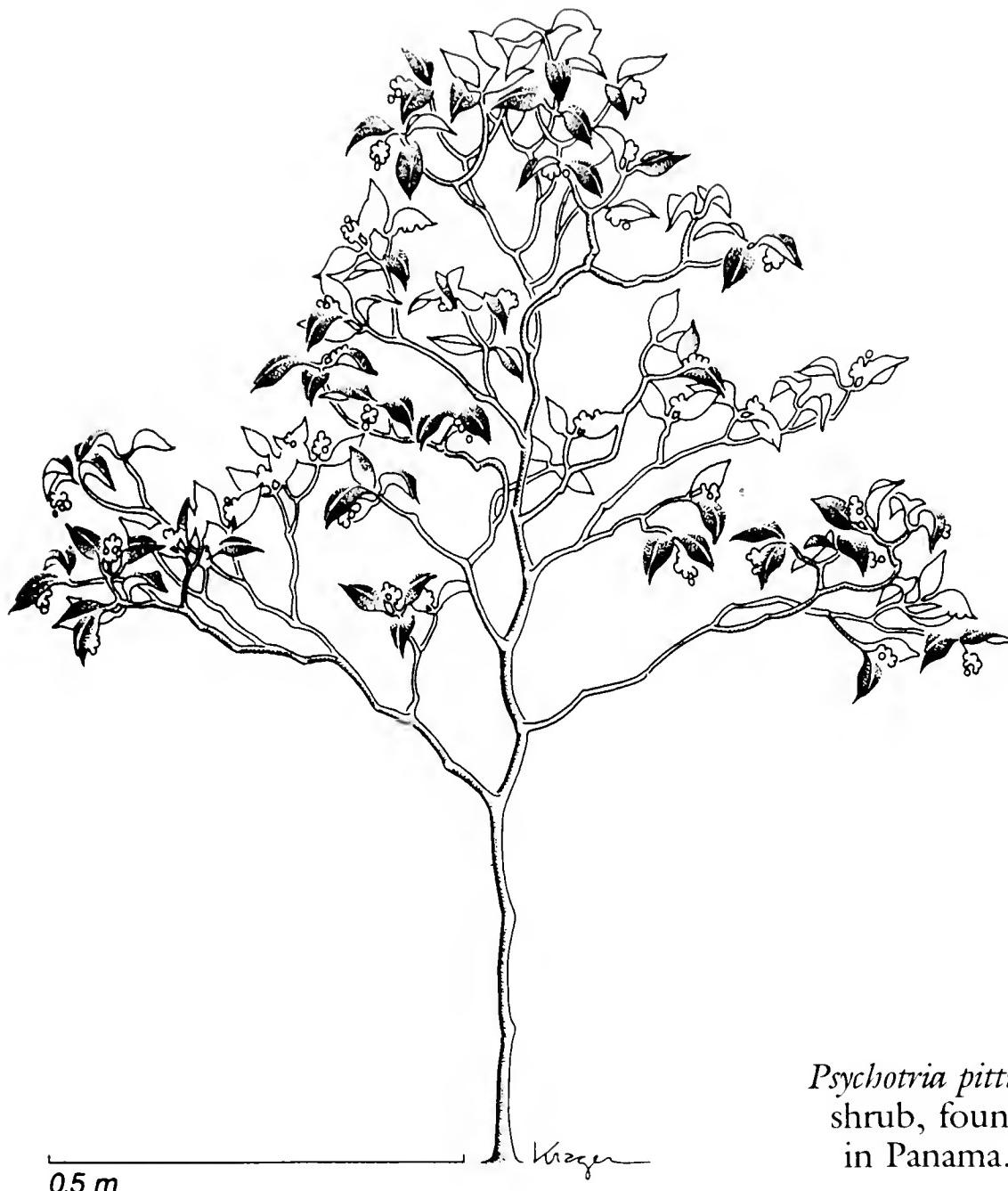
**Quercus ilex*, the Holm oak from the Mediterranean region, is much better known in our area, even being used as a street tree. It will get to be large with a rounded head of branches, the tips becoming pendulous with age. The Holm oak in our garden is beginning to show this characteristic at 30 years, becoming quite a handsome specimen. As a younger tree, however, it didn't have the appeal of the other evergreen oaks and I had no qualms about using it as a support for a *Clematis macropetala*. There were native red cedars on either side, but they were very dense, so the more open oak was perfect for the climbing vine; it was a very successful venture. The clematis is now two-thirds up into the 40' tall canopy of the oak and puts on a spectacular display in May.

Quercus calliprinos and *Q. trojana*, of Palestine and southeastern Italy, have survived our coldest winter, but have yet to be planted in the garden. The foliage of the young *Q. trojana* is especially beautiful; even though it is only semi-evergreen, it will be interesting to see it develop.

There is probably no single group of plants in our garden that has brought us more pleasure each spring than the evergreen oaks. Having them survive the winter is the first challenge met, and setting their first acorns is a thrill. But mostly it is their structural strength—balanced with the constant variation of foliage color and texture—that endears them to us and ensures them ever larger space in our landscape.

Mareen Kruckeberg has been a member of The Arboretum Foundation for over thirty years. She is also a member of American Rock Garden Society and the Northwest Horticulture Society. Her MsK Nursery grows its own stock from Northwest native seeds and cuttings, and seeds from all over the world (China, Japan, Chile, Russia, the south island of New Zealand, and South Africa). Mareen's requirement for MsK stock is that it be hardy to this region and interesting in the garden.

Joy Spurr's photographs of plants can be seen in textbooks and other publications around the world. She is a member of Unit 81 of The Arboretum Foundation.



Psychotria pittieri
shrub, found
in Panama.

Psychotria and the Conservation of Tropical Biodiversity

by Clement W. Hamilton

illustrations by Karen Krager

Psychotria, a plant genus, is being studied by Clement Hamilton for two reasons: to determine which tropical regions need the most intensive conservation effort and to find out about its intriguing method of reproduction.

We all have heard the mind-boggling numbers and estimates. Half to two-thirds of all species of life occur in the tropics on only six percent of the earth's land surface. One square mile of forest in northern Colombia hosts as many plant species as all of the British Isles. Twenty-five to 50 acres of tropical rain forest are being logged every minute. The human population of Kenya is doubling every 17 years, increasing pressure on the countryside. One-fourth of our pharmaceutical drugs owe their origins to tropical plants and

animals. This biological richness is going extinct, however, before we can survey the organisms for medicinal use or even finish our basic cataloging of the species (Myers 1984; Brown et al. 1989).

Just as citizens contribute to conservation organizations, I feel an obligation to dedicate a substantial portion of my research effort to biological conservation in general and to tropical conservation in particular—a “tithing” for biodiversity, if you will.

Since 1981, I have conducted research on a little-known genus, *Psychotria*, which is in the coffee family (Rubiaceae). Despite its relative lack of notoriety, it is one of the most diverse in the world, comprising approximately 1,650 species of shrubs, small trees, herbs, and epiphytes in all three tropical regions of the world: Latin America, Africa, and the Asian region. The three species in Florida are called *false coffee*, for their fleshy red fruit with two hemispherical seeds.

Conservation planners who wish to plan parks and reserves to conserve the most species in the United States or Europe can refer to floras such as that of Hitchcock and Cronquist (1973), species lists, and sets of copious herbarium specimens. However, the tropics are so little known, by comparison with temperate zones, that conservation planners do not have reliable floras and must rely heavily on knowledge of a few “indicator” groups: families and genera that are well studied

Glossary

Biodiversity refers to numbers of species of animals and plants in a given area, and their genetic variations.

Corolla consists of the petals of a flower.

Epiphytes are plants that grow on other plants, but derive their moisture and nutrients from the air and rain water that has flowed down the bark (stem flow) to collect minerals.

Flora is a book (or books) describing all species that occur in a particular geographic area.

In **heterostylous** species, half of the existing plants have flowers with a long style and short stamens, and are called "pin" morphs; the other plants have a short style and long stamens, and are called "thrum" morphs.

Pistil is the female organ of a flower.

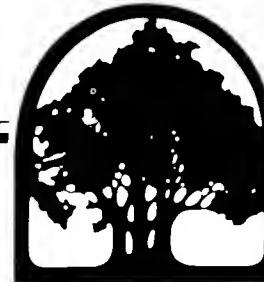
Stamen is the male organ of a flower, containing pollen.

Style is the narrow part of the pistil, through which pollen tubes grow.

and presumed to reflect patterns of species richness of tropical organisms as a whole. *Psychotria* is one such index group, which is why I undertook its study in Mexico and Central America when I was a student at the Missouri Botanical Garden in St. Louis, Missouri.

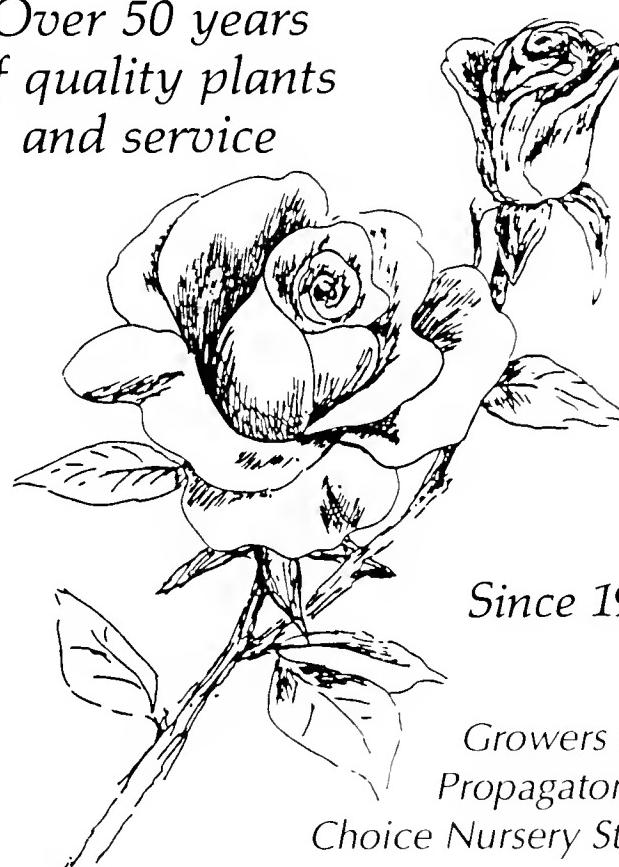
Psychotria's Reproductive Biology

Psychotria not only has the potential to provide information for conservation planning, but it is simply a fascinating genus. One of the most interesting aspects of its biology concerns its breeding (reproductive) system. Most species are heterostylous, a phenomenon first studied intensively by Charles Darwin in the genus *Primula*. In heterostylous species, half of the existing plants have flowers with a long style and short stamens; this is called a "pin" flower morph. The other half of the plants have a short style and long stamens; this is called a "thrum" morph. Pollen from *pin* plants only can fertilize their counterparts with *thrum* ovules and vice versa. In other words, even though a plant contains both male and female organs, it relies on another plant for pollinization. This method of reproduction avoids inbreeding and its sometimes harmful consequences such as deleterious genes becoming common. The mechanism ensures cross-pollination and continual genetic diversity within a population, so that species can evolve in changing circumstances.



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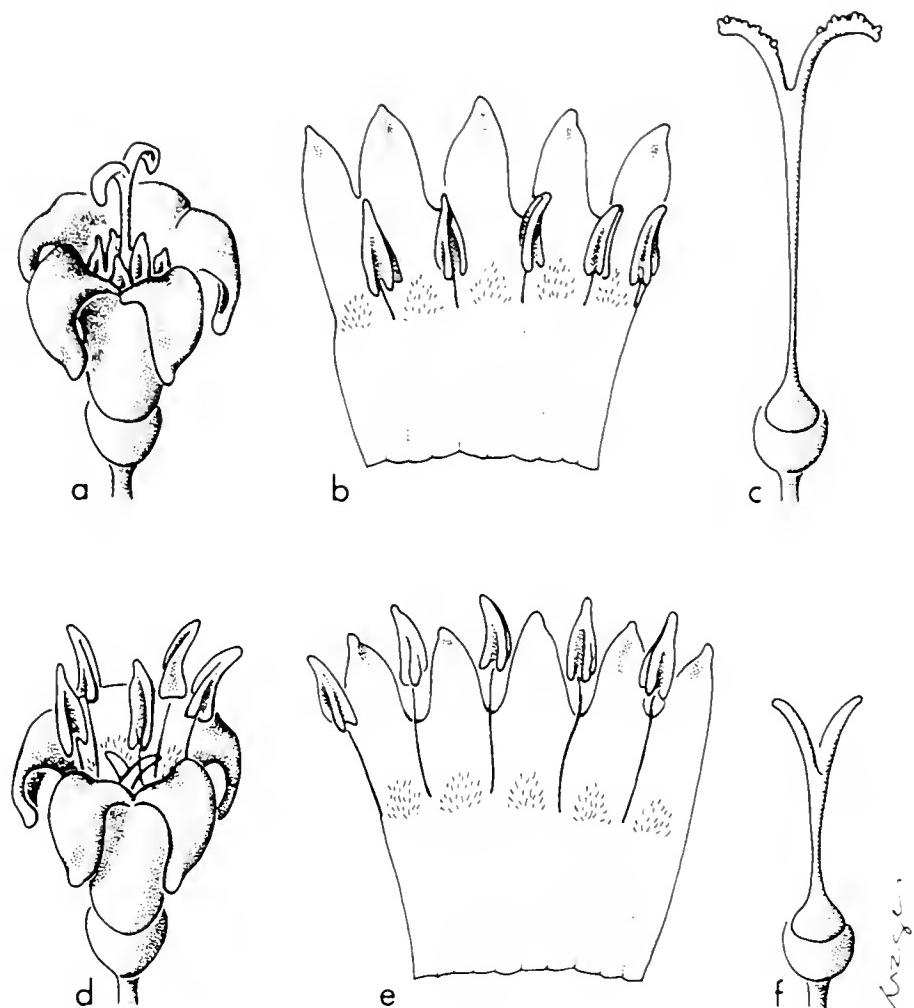
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The pin morph (a-c) and thrum morph (d-f) of *Psychotria marginata*. Complete flowers (a,d), opened corolla and stamens (b,e), and pistils (c,f).

Some other plant species are self-incompatible and others have male and female flowers on totally separate plants (dioecy), so why does *Psychotria* have its more complicated system? So *each* plant can bear fruit. It is thought that some insect flower-visitors, such as butterflies, rub against long flower parts and short parts on different areas of their bodies while they probe for nectar. Then they naturally deposit thrum pollen, from the long stamens, onto the long styles of the pin flowers of different plants, and vice versa. That way pollen is directed to its proper target and *all* plants can bear fruit, unlike those (such as hollies) with separate male and female plants.

Current research (Hamilton 1990) is providing information on the significance of heterostylous plants: why their reproductive mechanisms have evolved this way, what this means to their ecology, and its significance to their conservation. This will help us understand what size population is necessary to conserve a species, for instance.

Biogeography, Conservation, and *Psychotria*

Taxonomic research on *Psychotria* subgenus *Psychotria* in Mexico and Central America revealed the presence of 61 species, three of them divided into varieties. Fifteen of those species I described for the first time as being new to science. It is typical for tropical researchers to find 25 percent new species in any group studied, which further illustrates the paltriness of our knowledge of tropical diversity.

Of significance to conservationists, an interesting geographic pattern emerged. The greatest diversity occurs in Panama, which has 40 species, including 15 restricted (endemic) to the country. That diversity drops somewhat in Costa Rica, which is still relatively rich, and then plummets in Nicaragua, Honduras, and El Salvador, which have several species but no endemics. A secondary center of diversity appears in southern Mexico, Guatemala, and Belize. This general pattern is consistent with that found in other recently studied groups, such as *Anthurium* (Hamilton 1989).

These findings give a clear message to government agencies and conservation planners. In order to maintain carbon balance and not disrupt present patterns of temperature and precipitation, all forests are important. But for the preservation of biodiversity, a dollar spent conserving Panamanian forest—with more diverse native plant species—is much better spent than in Honduras, for instance. Armed with data such as that in *Psychotria*, agencies can make strong appeals to local governments, as well, in hopes they can all manage their natural heritage as well as Costa Rica is now demonstrating.

This is certainly an uphill battle, and there is much cause for pessimism. But the often quoted line of Edmund Burke bears repeating: “Nobody makes a greater mistake than he who did nothing because he could do only a little.”

Clement W. Hamilton is associate professor of horticultural taxonomy at the Center for Urban Horticulture, University of Washington, where he curates the Hyde Hortorium. He also serves on the board of directors of the Organization for Tropical Studies, Costa Rica, of which the University of Washington is a member institution.

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In the Washington Park Arboretum

by Timothy Hohn and
Christina Pfeiffer



Trail work with students from the Seattle Public Schools Work Program, supervised by Cathy Breummer, Arboretum staff.

Training for High School Students

This past summer, the Arboretum horticulture staff provided training for a group of 10 high-school age students enrolled in the Seattle Public Schools Work Training Program. The students, accompanied by two teachers and Arboretum staff, implemented some much needed renovation work on the Memorial Hillside (near where Loderi Valley intersects Azalea Way). In addition to weed control and mulching, the group rebuilt several paths and stairways to improve the access to this interesting area. The students, with additional help from a University of Washington student in landscape architecture, developed new skills in gardening and landscape construction during the course of this project. It was a very successful endeavor.

The Arboretum Hires a Field Arborist

On August 19, a new era of tree care began in the Arboretum with the hiring of Lou Stubecky, field arborist. Lou comes to us from the Davey Tree Expert Company with an undergraduate degree in forestry from Syracuse University. With the generous support of the Arboretum Foundation, Lou will be responsible for a complete range of tree care in the Arboretum, from the sapling stage to mature trees. He will be handling all ground-based tree care activities personally and managing contractors to accomplish the tree crown work. Immediate needs will focus on the

damaged and hazardous trees remaining from the storms of December 1990.

Three New Projects

Three very exciting projects have moved out of the planning stage and are now under review: (1) the plant collections display master plan for the entire Arboretum; (2) the program and concept statement for the renovation of Azalea Way; and (3) the program and concept statement for a synoptic garden at the Graham Visitors Center. The synoptic garden would provide a sample of the Arboretum collections. These projects are part of an Arboretum renaissance for the twenty-first century. More on these projects in upcoming columns.

Plants Collected from Chile

As a sponsor of a plant collecting trip to Chile conducted by personnel from the Arnold Arboretum, the Washington Park Arboretum received many interesting wild-collected accessions from this region. Many of these plants have been acquired at one time or another in the past; however, these collections represent new provenances and slightly different gene pools. We will watch them closely to document their growth and adaptability here in Seattle.

Recent New Accessions

105-91 *Arbutus* 'Marina' (Ericaceae): the product of a three-way hybrid selection of *Arbutus* taxa from the Mediterranean region and the Canary Islands. We received this 10' specimen as a gift from Briggs Nursery, Olympia, Washington. It is being introduced by the Saratoga Horticultural Foundation in California. The plant can



Building stairs in the Memorial Hillside with Seattle Public Schools Work Program students, supervised by Scott Williams, Arboretum staff.

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be seen in the Joseph A. Witt Winter Garden.

114-91 x *Chitalpa tashkentensis* 'Pink Dawn'

115-91 x *C. tashkentensis* 'Morning Cloud' (Bignoniaceae): selections of an intergeneric hybrid between *Catalpa bignonioides* and *Chilopsis linearis*, received as cuttings from the Rancho Santa Ana Botanical Garden in California. Originally hybridized in Tashkent in the then-USSR, this hybrid has coarsely willow-like deciduous foliage and is said to have an exceptionally long blooming period.

149-91 *Araucaria angustifolia* (Araucariaceae): a Brazilian monkey puzzle tree that we received as wild-collected seed. Ordinarily, this tree would be deemed too tender for Seattle, but this provenance collection may prove otherwise.

171-91 *Desfontainea spinosa* (Loganiaceae): a wild collection from Chile by the Arnold Arboretum, Jamaica Plain, Massachusetts, of a beautiful evergreen shrub with striking scarlet and yellow flowers.

Timothy Hohn is the curator of living collections for the University of Washington Center for Urban Horticulture and the Washington Park Arboretum, Seattle, Washington.

Christina Pfeiffer is the Arboretum's horticulturist.

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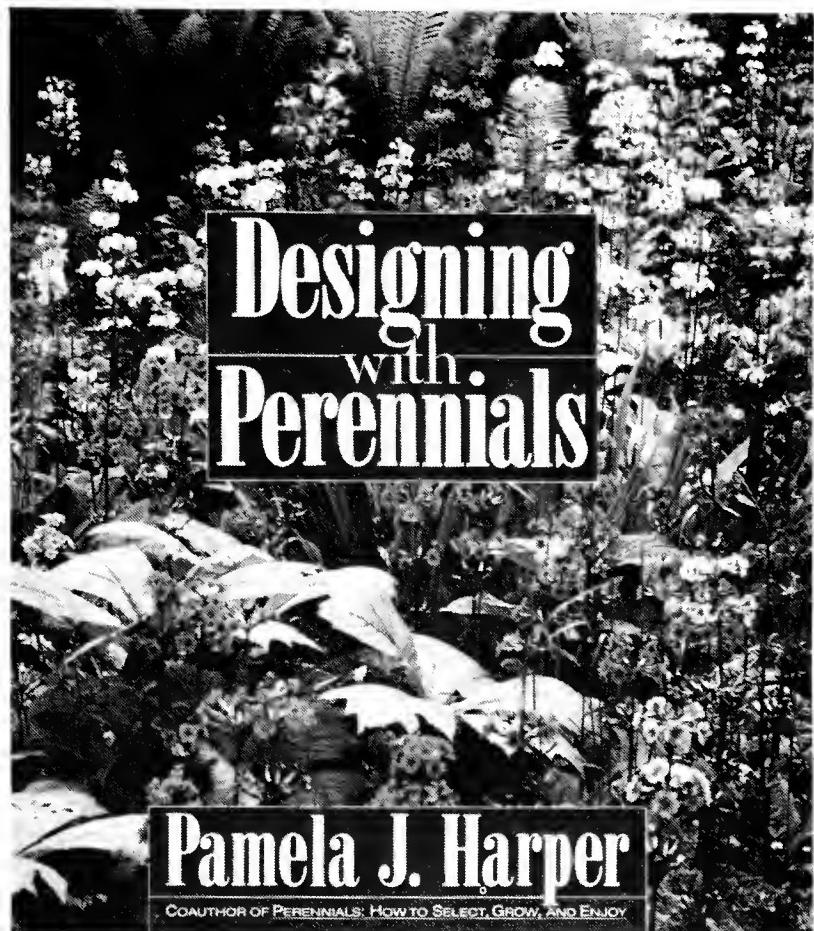
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Book Reviews

Designing with Perennials. Pamela J. Harper. MacMillan Company, New York. 1991. 326 pages. ISBN 0-02-548180-0. \$40.00.



Pamela Harper's new book does an excellent job of describing how perennials can be used in many ways in the landscape. She discusses growing them in borders between shrubs and separately in island beds. A chapter is devoted to ground-cover perennials.

Designing with Perennials is a book for the informed gardener and the landscape professional, alike. It has many beautiful photographs taken in gardens in England and in the United States, including Oregon and Washington State. The photographs illustrate the text very well and can be used by the professional designer to show prospective clients what can be achieved. Likewise, home gardeners can see groupings they would like to have in their own yard. Climate and soil differences in various parts of the country affect plant-growth habits, and although the book is primarily about gardening in the temperate areas of the southeastern United States, the Northwest reader will find most of the information in this book very relevant to their design needs.

Most of the plants that Pamela Harper mentions grow well in the Northwest. Some of her favorites are my choices as well (e.g., *Sedum 'Autumn Joy'*). I learned the identity of a tall blue aster I have been searching for; it is *Aster*

'Climax', a childhood memory. Unfortunately, I have not found it to be available in local nurseries. Some plants were new to me, among them being *Amsonia* and *Curtonus* which appear to be useful landscape plants. *Amsonia tabernaemontana*, a hardy *Vinca* relative of 2' tall, provides late spring color. In late summer, *Curtonus* blooms with orange-red trumpets similar to *Crocosmia*.

Pamela Harper has a strong sense of design which she expresses in many ways. A chapter is devoted to how the shape and size of the planting area—whether border or island bed—affects plant selection. Plant placement also is discussed. One interesting concept is putting taller flowers in front of lower growing varieties so the flowers at the back are viewed *through* foliage. This is particularly successful using tall grasses. The plant at the back should have brightly colored flowers such as *Pyrethrum* or maybe an annual red *Salvia*. Another tall see-through plant might be *Thalictrum delavayi* with heliotrope behind it. The lavender *Thalictrum* lightens up the dark purple heliotrope.

Color of flowers and foliage are frequently mentioned as design features. There is a lovely photo of the pale yellow *Oenothera missouriensis* growing together with *Coreopsis 'Moonbeam'* as an example of using a monochromatic color scheme.

The book covers many aspects of gardening, from selecting certain cultivars for their color of bloom to how to plant them for best effect. There are warnings about invasive plants, too. The most interesting chapter was on how perennials can be combined with shrubs in a mixed border for a variety of texture and color over a long season.

Designing with Perennials is a book to be enjoyed a little at a time. I needed a note pad to jot down all the gems of information to be found in its pages.—Pat Roome

Pat Roome, of Pat Roome Landscape Design, Inc., is a landscape designer and garden maintenance consultant in Bellevue, Washington. Her interests include perennial plants and ornamental shrubs. Pat teaches landscape and design classes at the University of Washington Center for Urban Horticulture and at Lake Washington Vocational Technical Institute. She is editor of *PlantSource Magazine* which provides a monthly updated list of plants available in the wholesale nurseries of Washington and Oregon. Pat writes an article on some aspect of horticulture for each issue of the magazine.

Mushrooms of North America.
Roger Phillips. Little Brown and
Company, Boston. 1991. 319 pages.
ISBN 0-316-70613-2. \$24.95.

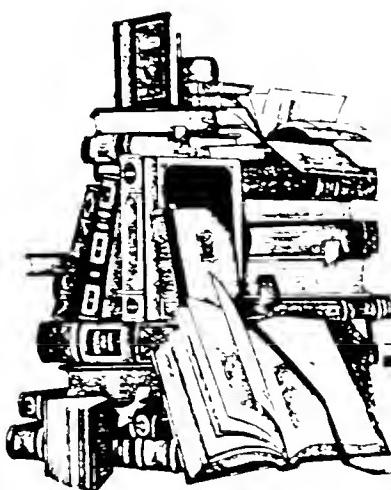
The new book by Roger Phillips addresses three to five times more species than usually found in mushroom identification handbooks. The book is well organized and provides considerable information for beginners.

Numerous pictures show the nature and habitat of over one-thousand species of fungi and mushrooms. Because of the many views of each species in the color plates, most of the salient characteristics are visible to the reader.

Even though there are no books that contain all

species of mushrooms for any area or region, many of our Pacific Northwest mushrooms are vividly displayed throughout the book's pages. It is very helpful because of the large number of species represented, and makes for great armchair viewing activity. Many amateurs, professional amateurs, and professional mushroom enthusiasts already have this on their reference shelves.—Coleman Leuthy

Coleman Leuthy is a member and past president of the Puget Sound Mycological Society and is on the education committee of the North American Mycological Association. Coleman is past president of the Pacific Northwest Key Council, which writes keys for identifying mushrooms without having to use the microscope.



New on the Shelves of the Elisabeth C. Miller Library

by Valerie Easton

With the profusion of new garden books, it can be difficult to find the perfect gift. As the holidays approach, any of these especially interesting newer titles would be welcomed gifts for the gardener on your list—or for yourself.

Two recent publications should be at the top of the list of books for the Northwest gardener's home library: *Trees and Shrubs for Pacific Northwest Gardens* (John and Carol Grant. Portland, OR: Timber Press, 1990. ISBN 0-88192-145-9) and *Trees of Seattle* (Arthur Lee Jacobson. Seattle, WA: Sasquatch Books, 1990. ISBN 0-912365-34-X). Both are reviewed in the Arboretum Bulletin 52:2.

Another title with a Northwest emphasis is *Perennials: Toward Continuous Bloom* (Anne Lovejoy, ed. Deer Park, WI: Capability's Books, 1991. ISBN 0-913643-06-8). This is the first in a planned series featuring current American garden writers, and focuses on perennials. Due to its local editor, Northwest writers are well represented. Article topics and writing quality vary widely, but it is a pleasure to read about the ideas,

progress, and biases of more than 35 perennial experts. Especially useful is learning about the favorite plants, including sources, of local gardeners such as Peter Ray, owner of a Vashon Island specialty nursery; Jerry Sedenko, garden designer and writer; Judith Jones, fern expert; Susan Buckles, the gardener responsible for the ornamental borders at Children's Orthopedic Hospital; and other local plant experts.

A unique collection of interviews, *Gardening from the Heart: Why Gardeners Garden* (Carole Olwell. Berkeley, CA: Antelope Island Press, 1990. ISBN 0-917946-05-7) also emphasizes western gardeners. Looking for explanations as to why we garden, rather than the kind of information found in garden design books or plant encyclopedias, Olwell interviewed gardeners from all over the United States who create and work in a wide variety of gardens. Personal gardening histories, childhood memories, and feelings about gardening are expressed by Mary Kenady, who cultivates 10 acres outside of Duvall, Washington; Loie Benedict, a plant lover who also gardens in

Duvall; and Linda Bevilacqua, a "you pick" market gardener in Kent, as well as 15 other passionate, involved gardeners. Excellent and unusually detailed photographs, along with information on favorite plant combinations, organic gardening practices, and an overview of pesticide problems and alternatives, make this book as useful as it is pleasurable to read.

Garden explorers will be pleased to see that there is a new series on North American gardens, with the second volume devoted to West Coast gardens. *The Complete Guide to North American Gardens*, volume 2: *The West Coast* (William C. Mulligan. Boston: Little, Brown and Company, 1991. ISBN 0-316-58909-8) covers gardens from Alaska to California, and includes Hawaii. It is of handbook size and format, with information on hours, fees, directions, telephone numbers, amenities, and special features. What makes it special are its clear, beautiful color photos of each garden described. A fall color photo of the Washington Park Arboretum and a Japanese Garden spring photo with wisteria and azaleas in bloom are very enticing. Short essays on the gardens give a feel for what is special and noteworthy about each. There are some errors (the locks bordering the Carl S. English, Jr. Gardens in Ballard are actually 975-feet long, not 43 times that much), and some omissions (such as Lakewold, near Tacoma, Washington, and the Garden at Bishop's Close at Elk Rock, outside of Portland, Oregon). However, the guide is welcome for its regionalism and currency. It is also welcome for the photograph of Ohme Gardens on its cover, showing the blooms of sedum and thyme in the foreground and the panorama of the lush garden stretching out through the trees to the dry hills of Eastern Washington.

A classic and extensively detailed survey of perennials has been significantly revised. The third edition of Graham Stuart Thomas's *Perennial Garden Plants or the Modern Florilegium* (Portland: Timber Press, 1990. ISBN 0-88192-167-X) is written by a man who believes that "a garden without herbaceous plants is almost nonexistent." To further the use of these plants, Thomas includes information on bulbs, grasses, biennials, ferns, woodland, and bog plants. He has grown "some nine-tenths" of the plants listed, and believes they should be used throughout the garden to complement other plants and structures, not just in the traditional herbaceous bor-



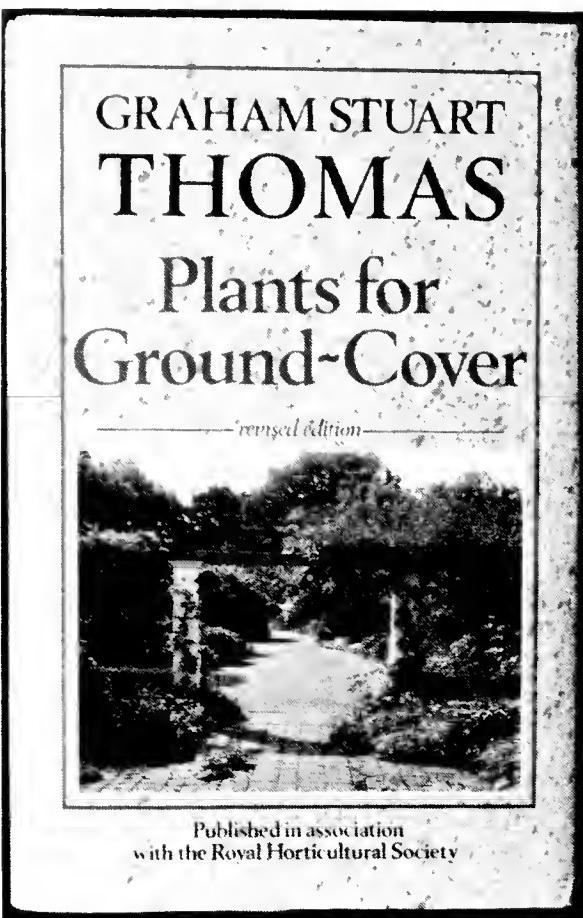
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der. To help the reader do just that, most of the book consists of listings of over 2,000 species and a greater number of hybrids and cultivars, including information on height, color, flowering, and cultivation, along with personal notes, opinions, and a bit of history about each plant.

This revision of *Perennial Garden Plants* includes U.S. hardiness zones and over 250 further species and varieties. Clear color and black-and-white photographs help with identification, but most of the book is made up of the exhaustive listings. Also helpful is the section "Cuttings from My Notebook," which includes knowledgeable suggestions on color schemes, plants for wet areas, and evergreen perennials. If you plan on buying a book on perennials, also look at Pamela Harper's new work, *Designing with Perennials*, reviewed in this issue.

Now, as chrysanthemums are fading and the dahlias are spent, we wish we could prolong the pleasures of the garden for a few more months. Allen Lacy's *The Garden in Autumn* (New York: Atlantic Monthly Press, 1990. ISBN 0-87113-347-4) not only encourages the gardener to extend the season, but claims that mid-August to



early November can be more than a time of raking leaves and tidying up. Planting, transplanting, and weeding are ideally accomplished in the fall, and Mr. Lacy claims his garden is at its best and in full bloom in late September into October.

Chapters on lingering perennials, perennials specific to the season, bulbs, grasses, annuals, and woody plants explore the variety of materials found useful throughout the autumn months. The expected Japanese maples, mums, and heathers are discussed, as are the more unusual and unexpected plants such as perennial salvias and lobelias, alliums, and *Rosa glauca*. Beautiful photographs inspire the gardener with the array of color, texture, pods, bark, fruit, and foliage possible in the autumn garden.

Valerie Easton has been a librarian at the University of Washington Center for Urban Horticulture since 1985.

Also New

Alber, John I., and Delores M. Alber. *Baby-Safe Houseplants & Cut Flowers*. Highland, IL: Genus Books, 1990. ISBN 0-9626066-1-8.

Allison, James. *Water in the Garden: A Complete Guide to the Design and Installation of Ponds, Fountains, Streams, and Waterfalls*. Boston: Bulfinch Press, 1991. ISBN 0-8212-1839-5.

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Clarke, Ethne. *Hidcote: The Making of a Garden*. London: Michael Joseph, 1989. ISBN 0-7181-2938-5.

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